Idaho State University – Department of Physics
PHYS 499 / PHYS 630 Accelerator Physics — Spring 2009

Homework 8 (due Apr 8)

Consider a beam of emittance $\varepsilon = 10\ \mu$m propagating in a periodic FODO structure consisting of thin lenses of focal lengths $\pm F = \pm 8$ m separated by drifts of length $L = 10$ m.

1. Write the transfer matrix M for one FODO period and calculate the phase advance μ. Is the motion stable?

2. Compare the transfer matrix M expressed in terms of F and L with the one expressed in terms of the Courant-Snyder parameters to calculate the values of α, β, and γ at two locations: (1) just before the focusing lenses and (2) just before the defocusing lenses.

3. Use the propagation matrix for the Courant-Snyder parameters to produce a plot of $\alpha(s)$, $\beta(s)$, and $\gamma(s)$ in the interval $0\text{ m} < s < 40\text{ m}$.

4. On a separate plot, draw the beam envelope $\sqrt{\varepsilon\beta(s)}$ for $0\text{ m} < s < 40\text{ m}$.